AMES ASTROBIOLOGY INSTITUTE
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Thank you for that kind introduction. Before I get started, I want to salute Harry McDonald for his strong leadership here at NASA Ames Research Center. I also want to thank Scott Hubbard for his hard work and dedication as the Interim Director of the Astrobiology Institute. Scott, you've set a pretty high standard for your successor. Thank you.

It is an honor to be with you today as we announce the new Director of NASA's Astrobiology Institute.

Today, we're embarking upon a new era of discovery . . . and by naming the first Director to this facility we open a new multi-disciplinary field of scientific exploration. It will couple experts in astronomy, molecular biology, genomics, geology, ecology, paleontology, physics, chemistry and zoology. This new field of study will bring a new understanding of fundamental life processes on Earth and throughout our Universe, if it exists. It is a revolution that will require its own revolution. In other words, to make these new astrobiological observations and discoveries we need a revolution in communications, networking, information technology, computing and scientific thinking.

It is not by accident that this Institute is located here in Silicon Valley. Everyone on the NASA team, especially the NASA Ames team, should take pride as we place this cornerstone to NASA's mission in the new millennium.

A new field providing new answers

At the turn of the last millennium, some of the visionaries of the day united the small population of the Dark Ages with an uplifting vision of the future -- expressed through the construction of the great cathedrals of Europe. The task took generations but along the way communities arose and knowledge accumulated, leading to the great flowering of the Renaissance.

Now, I am not here to promise a new era of architectural marvels. But as we stand at the brink of this new journey, one so vast and with goals so staggering, we hope to bring a level of understanding and benefit much like what was achieved over the last 50 years in physics. Empowered with the tools of atom smashing, the best and brightest scientists around the world peeled the onion of the nucleus and described the fabric of our Universe. It has allowed us to reach back to a hundredth of a millionth of a microsecond after the Big Bang.

Today's quest: to understand how life can develop and evolve -- here on Earth and perhaps elsewhere in the Universe.

This journey will require dedication and teamwork . . . intelligence and the technologies of the future. Today I am proud to be here as we announce the beginning of this effort. However, this NASA led Institute will only reach its goals through the strong partnerships it will form with universities, non-government and governmental research institutes and research facilities around the world. In fact, just yesterday I was at the University of Washington. They have just developed our nation's first graduate level program in astrobiology. I am confident that this Institute will inspire other universities to follow their lead.

The major goal of the Astrobiology Institute is to answer three age-old questions:

- How does life begin and evolve?

- Does life exist elsewhere in the universe?

- and, what is the possible destiny of life on Earth and beyond?

Bioinformatics and the technical challenges

To answer these simple yet elusive questions we will peer beyond our solar system, possibly as far as the edge of the Universe. We will need diverse and complex observation systems. Initially through robots, and then intelligent robotic colonies and later humans integrated with robotic systems and by using revolutionary telescopes we will gather information to detect life-processes beyond Earth.

We will start by building our understanding of basic life processes here on Earth. We know that life exists in harsh, extreme environments – in places that you wouldn't expect life to survive, like volcanic vents at the ocean's floor. With this new understanding we may be able to capture and develop the universal fingerprints of life processes.

At this virtual Institute the finest minds in the world, using the best computer models and simulation will couple their theories with observations in the lab, on Earth, in our solar system and, yes, maybe even beyond.

Astrobiologists will continue to explore these extreme environments on Earth, and we will build simulation chambers that model the conditions of early Earth, present day Mars, the moons of the outer planets and the predicted ecosystems on planets around other stars.

Just think about it . . . let it seep in.

We also hope to simulate a cell's metabolic processes and search for the complex chain of interactions that may determine how life originates and evolves. And here on Earth these models may even lead to new computing tools that are either biologically based or mimic biology – much as past

neurological investigations led to mimicking the brain's information management processes in neural networks.

The Institute's investigations may lead us to Mars, to other planetary moons, asteroids or comets, the Kuiper belt and the Oort cloud . . . Like the Rosetta stone, they may hold the secrets of life's processes and the beginnings of our Universe.

We hope to confirm our findings with new observation capability that should allow us to directly detect and image life processes on planetary bodies orbiting other stars. Today, we are not certain what the definition of "life processes" encompasses. On Earth, it is carbon-based. Perhaps, in another solar systems life may take other forms. The Astrobiology Institute seeks to unlock this mystery.

To get there, astrobiologists will define and develop new instruments and sensors to search for life beyond Earth. These sensors may be adapted from DNA chip technology and may employ biologically inspired electronics that one day may lead to evolvable, adaptable, morphing spacecraft systems. Who knows, in the future it may no longer be called "Silicon" Valley.

Future robots or astronauts using these new tools on planets such as Mars may burrow deep beneath the dead surface and possibly find aquifers teeming with ancient organisms. If we find that Europa has a liquid ocean beneath its icy crust, submarines led in concept by the Astrobiology Institute may discover, analyze and automatically sequence the genome of any microbes found there.

Just imagine how finding even single-cell life-forms on other planets may add to our understanding of the biodiversity in our universe. Research on these yet-undiscovered organisms when coupled with Earth-based research might give us an additional boost to unlock some of the mysteries of today's

seemingly incurable diseases. But we won't know about them until we get there, and we won't get there until we develop the right technologies.

Quite possibly the rewards from this pursuit of Astrobiology may eclipse the societal and economic benefits of all prior NASA activity.

Now we cannot visualize how humans may get beyond the edges of our solar systems. Perhaps we will have the Nina, the Pinta and the Santa Maria of the future. These spacecraft will have biochips encapsulated in their small vehicles. As they go through the vast medium of interstellar spce they will consume minimal energy, have incredible computational power and unbelievable sensory capability. Maybe one day beyond that even more spectacular missions may be possible.

Such intelligent space explorer systems as I've described are already being worked on by NASA. As part of our Information Technology Program, we're developing intelligent software and hardware which we will need to perform those unbelievably complex tasks in real time, on Earth and in deep space.

One of the reasons for locating the Astrobiology Institute here at Ames is to enable the synergy between Information Technology and Astrobiology.

Later today we will be signing an agreement with a corporation here in Silicon Valley. NASA will collaborate with this company to develop the first of a long line of advanced computers, which will design the spacecraft of the next millennium, the new astrobiological computing systems and may also provide more powerful, more intelligent portable diagnostic devices for physicians, engineers, and others.

To further the integration of Astrobiology and Information Technology, we have designed the Institute to be "virtual". This collaborative environment already has eleven principal investigators distributed around the country . . .

they are the first nodes of the Institute. With this foundation we are building the Institute and we are growing in scope and participation.

Finally, the Institute is a public-private partnership -- an example of the new way of doing business within NASA. We are bringing together the best minds and thinking from government, private industry and academia, all working together toward a common goal – trying to discover if there is a thread of life beyond Earth. It is a powerful concept. And it is a concept whose time has come.

Today, we take an important step forward by naming the Institute's first Director – a Nobel Prize winner who is committed to providing the scientific direction for the future.

We hope the accomplishments of the Astrobiology Institute will contribute to the new millennium in the same way that the cathedrals contributed to the Renaissance. Being selfish, I'm hoping that it won't take centuries to get there.

T.S. Eliot could have been speaking about the journey we embark on today when he said: "Only those who will risk going too far can possibly find out how far one can go."

We at NASA can't wait to find out.

Thank you.